

Benefits

No-Compromise NVMe storage

- World's First Hyperparallel Flash Array
- High-Performance, Low-Latency, Linear Scaling, and Compact Chassis Maximizes Data Center Efficiency
- Concurrent Block & File Protocols

End-to-End NVMe

- 72 U.2 2.5" NVMe drives in 1-4 Media Groups
- Supports Storage Class Memory (SCM)
- Simultaneous NVMe-oF/TCP, NVMe-oF/Ethernet, NVMe-oF/InfiniBand

Storage Disaggregation

- 25X Faster Than AFA for \$/IOPS
- 50% Faster Than DAS for \$/BW
- 2X Denser Compute
- 67% Faster Searches
- 2-3X Lower Storage TCO
- 3X Better Management with SAN-Like Features

Massive Performance & Capacity

- Scale-out design with multi-controller architecture
- 90GB/s B/W, 20M IOPS, and 40µs latency
- 1.1PB of capacity using 72 16TB NVMe SSDs

Economical & Enterprise Features

- Instant and space-saving snapshots and clones
- Distributed DP RAID with 12X Faster Rebuild Than DAS and Legacy AFAs
- Data Assurance for Integrity Validation
- Thin Provisioning
- Always-On Data at Rest Encryption
- OpenChoice Storage™ Lowers TCO

100% Standards Compliant

Pavilion Hyperparallel Flash Array

Accelerate legacy and modern data applications

The Pavilion Hyperparallel Flash Array (HFA) is the world's first NVMe-oF Storage Array. It is an end-to-end NVMe solution, from the host to the media. The array is 100% standards compliant with zero host-side presence, contains no ASICs or FPGAs. It leverages off the shelf processors and SSDs, and is designed to accelerate legacy and modern rack-scale web and analytics applications.

- Industry's First Hyperparallel Flash Array
- Up to 20 Storage Controllers and Parallel Architecture Boost Performance
- 40 Ethernet or InfiniBand Ports for Flexible Connectivity
- 90 GB/s R/W Throughput, 40 µs Latency, and 20M 4K Random Read IOPS¹
- 4RU Chassis
- Active/Active Data Access
- No Single Point of Failure
- End-to-End NVMe with simultaneous NVMe/Ethernet, NVMe/InfiniBand, and NVMe/TCP protocols
- Support of iSCSI and NFS for legacy applications

End-to-End NVMe

- Up to 72 U.2 2.5" NVMe NAND and SCM SSDs
- OpenChoice Storage™
- NVMe-oF/RDMA (Ethernet and InfiniBand)
- NVMe-oF/TCP
- iSCSI and NFS for legacy applications
- Standard drivers

OpenChoice Storage™

Pavilion OpenChoice Storage disrupts conventional selling practices and avoids vendor lock-in by providing customers the freedom of using their own SSD media in the Pavilion HFA.

- Freedom to innovate by embracing and upgrading to next-generation NVMe SSDs at a customer's own pace or for business needs. You may want to use capacity SSDs and SCM SSDs for performance
- Freedom to repurpose by turning storage media into a reusable asset in the customer's environment, based on ever changing application requirements
- Freedom to save by leveraging supplier relationships



¹Based on Pavilion Data Internal Analysis

Features

- Simultaneous NVMe/Ethernet, NVMe/TCP, NVMe/InfiniBand, NFS v3/v4, and iSCSI With Standard Drivers
- Up to 40 100Gb Ethernet and InfiniBand Ports

Flexible Management

- Web GUI and CLI
- vCenter, Kubernetes, and OpenStack
- RESTful API, DTMF/Redfish, and Swordfish

Endurance & Reliability

- Continuous Operations
- Modular Architecture With Hot-Plug Support
- 24/7 Proactive Support
- Telemetry to Cloud-based Portal
- Designed for High-Reliability with No Single Point of Failure

Pavilion^{OS}

Pavilion HFA delivers rich, enterprise data services. Modern applications deserve a modern storage OS. The Pavilion^{OS} is purpose built for NVMe. With no legacy to protect, the Pavilion^{OS} is free from years of code bloat, heavy reliance on DRAM, and backward compatibility for SATA and SAS SSDs.

All storage services, APIs, and advanced data services are built-in and included with every array.

Multi-Fabric

The Pavilion HFA supports 40 Ethernet and InfiniBand ports and simultaneous protocols that eliminate unnecessary protocol translations while enabling NVMe semantics for low-latency and high IOPS across a range of topologies including NVMe/Ethernet, NVMe/TCP, NFS, iSCSI, and NVMe/InfiniBand.

Instant Space Saving Snapshots and Clones

Multiple logical and crash-consistent copies can be made of any volume and served out to different applications individually. These copies are consistent, space-efficient, instant, and writeable. Created instantly without physical data copy activities occurring; blocks are then written as the copy or original is modified over time.

Thin Provisioning

Volumes are logical NVMe disks and used as a regular block device. The volume is thin provisioned from the media group. The user sees the provisioned size of the volume, but space is only allocated as-needed to maximize utilization. Volumes can range to 100s of TBs and can be re-assigned or shared between systems as needed.

Distributed Dual Parity RAID

Fully populated, the array organizes NVMe SSDs into 4 groups of 18 drives. Pavilion implements Dual-Parity RAID within a group, resulting in 16 RAID protection. The overhead for RAID 6 is less than 12%. Optionally a hot spare can be defined, resulting in 15+2 RAID 6 protection.

Fast RAID "SWARM" Rebuild

In the event of a drive failure, multiple controllers swarm the replacement drive in parallel to ensure fast rebuild. A 2TB drive is recovered in less than 5 minutes. With the Pavilion HFA, an application's SSDs are fully rebuilt with RAID 6 protection 12X faster than using DAS or an all-flash array.

High Availability

Achieving the necessary level of availability and reliability for massively parallel modern applications is costly. Underutilized and stranded capacity trapped in servers in the event of a failover and the operational overhead of managing these isolated servers is an ongoing challenge for IT. All I/O can be performed by multiple storage controllers, increasing data availability.

Non-Disruptive Software Upgrade

Meeting government compliance requirements is a fundamental part of the system design. All Pavilion^{OS} updates can be applied without disruption to ongoing I/O operations.

Data Assurance

All data written to the Pavilion HFA is validated on subsequent read operations, and if corrupted it will be rebuilt using the distributed RAID 6 protection. This ensures that applications never get corrupted data.

Data at Rest Encryption

Security is a must, so Pavilion implements FIPS-compliant data at rest encryption and ensures the always-on encryption does not impact performance.

Framework Integration

A full-featured Web GUI and CLI deliver deep insight into performance metrics at the volume/application, controller, port, or system level. The Pavilion HFA can also be managed using vCenter, Kubernetes, RESTful API, OpenStack, DTMF/Redfish, Swordfish, and more.

Support Telemetry

The Pavilion HFA reports issues to Pavilion's cloud-based support portal for analysis by Pavilion. The support portal enables Pavilion to proactively respond to any issues, and to perform problem solving operations remotely.

Technical Specifications

Performance	Capacity	Physical
Elite	Very High	Bandwidth: Up to 90 GB/s R/W IOPS: Up to 20M Latency: Down to 40µs Capacity: 230 TB – 1.1 PB RAW – 202 TB-978 TB Usable
Elite	Medium	Bandwidth: Up to 90 GB/s R/W IOPS: Up to 20M Latency: Down to 40µs Capacity: 230 TB – 1.1 PB RAW – 202 TB-978 TB Usable
Premium	High	Bandwidth: Up to 50 GB/s IOPS: 6M Capacity: 230 TB – 1.1 PB RAW – 202 TB-978 TB Usable Latency: Down to 150µs
Premium	Low	Bandwidth: Up to 50 GB/s IOPS: Up to 6M Capacity: 230 TB – 1.1 PB RAW – 202 TB-978 TB Usable Latency: Down to 150µs
Basic	Medium	Bandwidth: Up to 25 GB/s; IOPS: Up to 10M Capacity: 57 TB – 550 TB RAW; 50 TB – 489 TB Usable Latency: Down to 200µs
Basic	Very Low	Bandwidth: Up to 25 GB/s; IOPS: Up to 10M Capacity: 57 TB – 550 TB RAW; 50 TB – 489 TB Usable Latency: Down to 200µs

Technical Specifications

Common Specs

Power Consumption	3200 Max Watts
Heat Dissipation	10922 Max BTU
System Height	4 Rack Units
Protocols & Transports	Simultaneous NVMe/Ethernet using RoCE v2, NVMe/InfiniBand, NVMe/TCP, NFS v3/v4, iSCSI
Software Services	Snapshots, Clones, Data at Rest Encryption, Thin Provisioning, RAID, Rapid "SWARM" RAID Rebuild, Data Assurance
Management	Web GUI, CLI, vCenter, Kubernetes, RESTful API, OpenStack, DTMF/Redfish, Swordfish, and SNMP v2c
Support	24/7 Proactive Support with Cloud-based Telemetry
Physical Interfaces	Up to 40 ports of 100 Gb Ethernet or InfiniBand for Storage Services Up to 2 ports of 10 GigE for Management
Dimensions	17.5" W x 31.1" D x 6.9" H
Weight	147 lbs. (66.7) (loaded with SSDs)
Safety	IEC/EN 60950, CB Certificate, UL60950-1 CAN/USA-C22.2, CE Mark.

Capacity-Based Model

The Pavilion HFA supports multiple applications with the capacity and performance ideal for one or many applications. Choose the tier needed and move between tiers or move up to a higher performance/capacity tier, increasing performance and capacity linearly.

Elite performance tier
Up to 90 GB/s speed, supporting capacities of 230TB to 1.1PB

Elite performance
at **Medium** capacity



Elite performance
at **Very High** capacity

Premium performance tier
Up to 50 GB/s speed, supporting capacities of 115TB to 1.1PB

Premium performance
at **Low** capacity



Premium performance
at **High** capacity

Basic performance tier
Up to 25 GB/s speed, supporting capacities of 57TB to 550TB

Basic performance
at **Very Low** capacity



Basic performance
at **Medium** capacity

*All performance measurements taken in fully sustained mode with RAID6 enabled using NVMe-oF block protocol over Ethernet.

OpenChoice Storage™ includes Next Business Day support but does not provide warranty on customer owned SSDs. Pavilion simply licenses the populated NVMe drive slots (per year) and customers purchase a variable number of controllers and network ports depending upon their application requirements.